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"A Survey Paper on Botanic Cure: AI-Driven Medicinal Leaf Analysis"

Nagamma[1], P Sravya[2], Prajna Gaonkar[3], Renuka C[4], Roopa O Deshapande[5]

VI sem, Dept. of Computer Science and Engineering, K.S Institute of Technology Bengaluru[1]

VI sem, Dept. of Computer Science and Engineering, K.S Institute of Technology, Bengaluru[2]

VI sem, Dept. of Computer Science and Engineering, K.S Institute of Technology, Bengaluru[3]

VI sem, Dept. of Computer Science and Engineering, K.S Institute of Technology, Bengaluru[4]

Assistant Professor, Dept. of Computer Science and Engineering, K.S Institute of Technology, Bengaluru[5]

Abstract: The increasing reliance on artificial intelligence (AI) for ground breaking medical advancements has led to innovative solutions in botanical medicine. "Botanic Cure: AI-Driven Medicinal Leaf Analysis" represents a pioneering approach to identifying and analysing medicinal properties in leaves using AI technologies. This study harnesses machine learning algorithms to extract, classify, and evaluate bioactive compounds within various plant leaves, aiming to streamline the discovery of new medicinal agents and enhance therapeutic efficacy. By integrating AI with traditional botanic practices, this research demonstrates significant potential in revolutionizing pharmaceutical development, providing an efficient pathway for discovering novel treatments for a wide array of diseases. Key findings reveal the accuracy and speed of AI in medicinal leaf analysis, promising substantial contributions to the field of herbal medicine and pharmacognosy.

Keywords: Leaf identification, Medicinal properties, Plant species, Herbal medicine, Image recognition, Plant database, Xception

I. INTRODUCTION

The integration of artificial intelligence (AI) into scientific fields has led to significant advancements, particularly in botanical medicine. *Botanic Cure: AI-Driven Medicinal Leaf Analysis* is an innovative initiative that harnesses AI to revolutionize the discovery and analysis of medicinal properties in plant leaves.This project utilizes advanced machine learning algorithms to extract, classify, and evaluate bioactive compounds in various plant species. By doing so, it accelerates the identification of novel medicinal agents that can be used for developing treatments for numerous diseases. The combination of AI with traditional botanical knowledge enhances the therapeutic efficacy of natural remedies and contributes to pharmacognosy.

Beyond efficiency and accuracy, *Botanic Cure* highlights the importance of interdisciplinary collaboration in pharmaceutical development. The project offers a streamlined approach to discovering new treatments, ultimately improving healthcare outcomes and broadening the scope of herbal medicine. AI-driven analysis enables a more systematic study of medicinal plants, reducing the time and resources needed for research while increasing reliability. Additionally, this initiative opens new avenues for research and could lead to groundbreaking treatments for diseases that have eluded conventional medicine. It also emphasizes sustainable and eco-friendly practices, as medicinal plants are renewable resources that can be cultivated with minimal environmental impact. By integrating AI with botanical research, scientists can explore plant-based solutions to complex health issues, ensuring that traditional remedies are validated and optimized for modern use.

In summary, *Botanic Cure* leverages AI to transform botanical medicine, bridging technology with traditional knowledge to uncover new medicinal compounds. This approach paves the way for more effective treatments, promoting advancements in both modern and herbal medicine while enhancing global healthcare. The synergy between AI and botanical science offers a promising future for drug discovery, natural product research, and holistic medicine.

II. EXISTING SYSTEM

Paper [1] explores deep learning for medicinal plant identification using pre-trained models like Xception, ResNet, and InceptionV3. The system, trained on an Indian medicinal leaves dataset, achieves 93% accuracy with Xception.

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A user-friendly interface enables plant recognition, benefiting researchers, herbal medicine users, and conservation efforts through automated classification.

Paper [2] presents a Vision Transformer (ViT)-based approach for medicinal plant identification and classification, addressing the limitations of traditional and CNN-based methods. By using self-attention mechanisms, data augmentation, and high-resolution datasets, the model achieves over 95% accuracy, outperforming conventional CNNs. The study highlights applications in herbal medicine and biodiversity conservation.

Paper [3] surveys deep learning approaches for medicinal plant identification, emphasizing CNN-based models achieving up to 99% accuracy. It explores various real-world applications, highlighting automation benefits, mobile platform adaptability, and model limitations. The study underscores the need for standardized datasets and improved adaptability for diverse environmental conditions.

Paper [4] proposes a deep learning-based method for medicinal plant identification using image processing and feature extraction. It employs ResNet50V2 and MobileNet SSD models, achieving 85% accuracy. The study integrates a web platform for real-time identification, aiding botany and pharmacology while promoting traditional medicine through automated plant recognition.

Paper[5] presents a deep learning approach for medicinal plant identification and therapeutic use prediction using transfer learning with VGG16, InceptionV3, and Xception models. InceptionV3 with an SVM classifier achieved 99.34% accuracy. The study aids in preserving traditional medicinal knowledge and automating plant recognition for healthcare applications.

Paper[6] explores a deep learning-based method for medicinal plant identification using ResNet50V2 and MobileNet SSD models. By leveraging image processing and feature extraction, the system automates plant identification with 85% accuracy. The study highlights applications in botany and pharmacology, emphasizing a user-friendly web interface for real-time identification.

III. METHODOLOGY

1. Algorithm

In AI-driven medicinal leaf analysis, pre-trained models commonly used include Xception, ResNet152 which are convolutional neural networks (CNNs) that excel in feature extraction from images. These models leverage transfer learning to enhance the accuracy of plant identification tasks. Pre-Trained Models in Medicinal Leaf Analysis.

The Xception model plays a crucial role in medicinal plant identification by leveraging deep learning techniques to classify plant species based on leaf images. It begins with an image preprocessing stage, where uploaded leaf images undergo resizing, normalization, and augmentation to enhance the dataset and improve model generalization.

The preprocessed image is then passed through the Xception network, which utilizes depthwise separable convolutions to extract fine-grained features such as leaf shape, vein structure, texture, and edge details. Unlike traditional CNNs, Xception enhances computational efficiency by independently processing spatial and depthwise feature information, leading to better feature extraction with fewer parameters.

As the image progresses through multiple layers of the model, residual connections help in refining the learned features and preventing information loss. The final feature representation is then passed through a fully connected neural network with a softmax classifier that assigns probability scores to different plant species. The species with the highest probability is selected as the predicted plant, and the system retrieves relevant medicinal information, including botanical name, uses, and benefits. If the plant is not found in the dataset, a default response is generated.By leveraging the Xception model's high accuracy and efficiency, the system provides a reliable and scalable solution for plant identification, aiding in research, conservation, and medicinal applications.

2 Dataset

a. Dataset Preparation

In this study, a custom dataset was created to train and evaluate the medicinal plant identification system. The dataset consists of images of four medicinal plant species**:** Curry Leaves **(***Murraya koenigii***),** Aloe Vera **(***Aloe barbadensis***),** Hibiscus **(***Hibiscus rosa-sinensis***),** and Neem **(***Azadirachta indica***)**. These plants were selected based on their significant medicinal value and widespread use in traditional medicine.

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b. Data Collection

The dataset was created by manually capturing high-resolution images of selected plant leaves. To ensure diversity and enhance the model's robustness, the images were taken under various environmental conditions, such as different lighting, angles, and backgrounds. Both a smartphone camera and a DSLR camera were used to capture the images, ensuring clear visibility of important leaf features like texture, venation, and edges. To maintain balance and avoid any bias in classification, each plant species was represented by a roughly equal number of images.

1. Working Procedure

The Fig.1 illustrates a systematic approach to medicinal plant identification using deep learning techniques, presented as a flowchart. The process begins with the user uploading an image of a plant, which is then passed through an image pre-processing phase to enhance its quality and ensure consistency for the deep learning model. This pre-processing step involves resizing the image to a fixed dimension, ensuring uniformity across different inputs. Additionally, normalization is applied to standardize pixel values, improving the model's ability to generalize and recognize patterns accurately. Augmentation techniques, such as rotation, flipping, or scaling, are also included to further enhance the dataset and artificially increase the image quality, lighting conditions, and plant orientations.

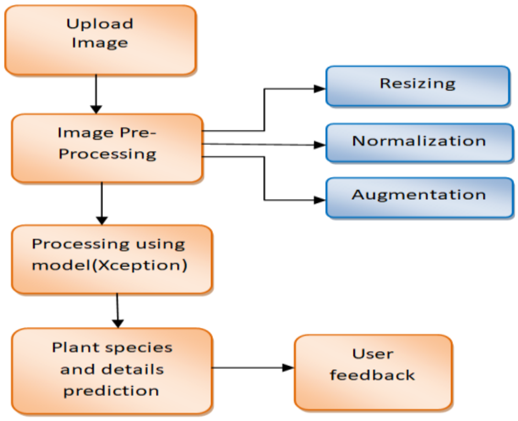

Fig 1. Work Flow of Botanic Cure

Once the image has been pre-processed, it proceeds to the processing phase, where it is analyzed using the Xception model, a deep learning architecture specifically designed for image classification. This model extracts essential features from the plant image, such as leaf shape, texture, and color, to accurately predict the species and its medicinal properties. Xception, known for its efficiency and accuracy, leverages depthwise separable convolutions to optimize computational performance while maintaining high classification precision.

After the model processes the image, it provides a prediction regarding the plant species along with detailed information about its medicinal uses. The system then incorporates a user feedback mechanism, allowing users to verify and assess the accuracy of the prediction. This feedback loop is crucial for refining the model over time, as it helps identify errors and enables further improvements through retraining with corrected data. By integrating artificial intelligence with user interaction, the system continuously evolves to enhance its identification accuracy. This structured approach to medicinal plant classification not only automates the identification process but also contributes to the preservation and documentation of traditional herbal knowledge, benefiting researchers, medical practitioners, and conservationists alike.

IV. RESULT AND ANALYSIS

As the *Botanic Cure* project is still in progress, the expected results focus on the system's ability to accurately classify medicinal plant species and provide relevant medicinal information. Our AI-driven model is designed to recognize four plant species—Neem, Aloe Vera, Hibiscus, and Curry Leaves—by analyzing leaf images and extracting key features using deep learning. The system is expected to produce highly accurate predictions, identifying the botanical name, medicinal uses, growing areas, and additional relevant details of the plant. If an uploaded image does not match any of the trained species, the system will provide a default message, ensuring clear user feedback and future dataset improvements.

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The effectiveness of *Botanic Cure* is expected to surpass previous plant identification systems due to several enhancements. Unlike traditional methods relying on simple image processing and feature extraction, our approach leverages the Xception deep learning model, which utilizes depthwise separable convolutions for efficient and accurate feature learning. Compared to earlier research that employed models like ResNet, InceptionV3, and MobileNet, our system aims to optimize both accuracy and computational efficiency by leveraging transfer learning and a custom-built dataset tailored to medicinal plant classification. Previous studies have achieved accuracy rates ranging from 85% to 99%**,** with some systems using ensemble models or vision transformers. We anticipate that *Botanic Cure* will achieve comparable or improved accuracy due to its refined dataset, robust preprocessing techniques, and real-time user feedback integration. Uploading image for plant identification:

Fig.2 Hibiscus Leaf

Fig.3 Aloevera

Fig.3 Neem Leaf

Fig.4 Curry Leaf

	Botanical Name	Family	Medicinal Uses	Cultivation areas	Toxicity warnings
Hibiscuss leaf (Fig 1)	Hibiscus rosa-sinensis	Malvaceae	Liver health improvement	India, China, Thailand ,Malaysia	May cause digestive issues
Aloevera leaf(Fig 2)	Aloe barbadensis miller	Asphodelaceae	Soothing of burns and sunburns	India,Africa Australia, China Pakistan	may cause abdominal pain
Neem leaf(Fig 3)	Azadirachta indica	Meliaceae	Blood sugar level control	India,Pakistan Bangladesh,Nigeria	May cause allergic reactions
Curry leaf(Fig 4)	Murraya koenigii	Rutaceae	Boosts hair growth	India,Sri Lanka Malaysia,Thailand	May cause digestive discomfort

Table 1. Expected Output

Additionally, most existing plant identification systems focus solely on classification, whereas *Botanic Cure* integrates a knowledge-based retrieval system that not only identifies plants but also provides comprehensive medicinal information. The inclusion of a user feedback mechanism further enhances the model's performance over time, making it more adaptable to diverse environmental conditions and variations in leaf images. Through these advancements, *Botanic Cure* is expected to set a new benchmark in AI-driven medicinal plant identification, improving accessibility to herbal knowledge while maintaining a user-friendly and efficient interface.

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V. CONCLUSION

The AI-driven plant identification system is expected to provide accurate, detailed, and easily understandable information about the medicinal properties of Neem, Aloe Vera, Hibiscus, and Curry Leaves. By utilizing advanced image recognition techniques, the system will offer insights into the botanical classification, medicinal uses, and growing regions of these plants. In cases where a plant is not recognized, users will be offered clear instructions and suggestions to enhance the recognition process, fostering a smoother and more informative user experience.This innovative approach of combining AI with traditional plant medicine not only enhances the accessibility of knowledge about these plants but also bridges the gap between modern technology and the rich history of natural remedies. The outcome of this research will contribute to the accurate documentation of medicinal plants, providing both scientific validation and practical applications for their use in healthcare and wellness.

REFERENCES

[1]. Rohan Kumar Verma, Prof. Syeeda and Sagar M Prajapathi," Medicinal Plants Identification Using Deep Learning" Vol-10 Issue-5 2024 IJARIIE-ISSN(O)-2395-4396.

[2]. Thendral R, Mohamed Imthiyas M and Aswin R, "Enhanced Medicinal Plant Identification and Classification Using Vision Transformer Model" 2024 International Conference on Emerging Research in Computational Science (ICERCS).

[3]. Revathy Prasannan, Preethy Roy, Jithi P V, Amritha R, Anjana V Nair, Ann Mariya Jose, " Medicinal Plants Identification Using Deep Learning: A Survey" 2024 IEEE Recent Advances in Intelligent Computational Systems (RAICS).

[4]. Sugantha Mallika.S.S, Dr.Bhaggiaraj .S,Thanujashree .C, Sri Aishwarya .J and Nandhini .N," Deep Learning Method for Detecting Medicinal Plants"2024 5th International Conference On Data Information and Cognitive Informatics(ICDICI).

[5]. Emiyamrew Azmeraw, Abebe Tesfahun, Tsegazewold Kinfu, Tenagne Fikirie and Kindu Tigabu," Deep Learning Approach for Medicinal Plant Identifcation and Therapeutic Use Prediction"2024 International Conference on Informationn and Communication Technology for Development for Africa(ICT4DA)..

[6]. Epie F. Custodio," Improved Medicinal Plant Leaf Classification using Transfer Learning and Model Averaging Ensemble of Deep Convolutional Neural Networks" 2024 International Conference on Information Technology Research and Innovation (ICITRI)